

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference H2748 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/US 03/04944	International filing date (day/month/year) 19.02.2003	Priority date (day/month/year) 01.04.2002
International Patent Classification (IPC) or both national classification and IPC C09J163/00		
Applicant 3M INNOVATIVE PROPERTIES COMPANY		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

- This report contains indications relating to the following items:
 - ☒ Basis of the opinion
 - ☐ Priority
 - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - ☐ Lack of unity of invention
 - ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - ☐ Certain documents cited
 - ☐ Certain defects in the international application
 - ☐ Certain observations on the international application

Date of submission of the demand 30.10.2003	Date of completion of this report 13.04.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Meiners, C Telephone No. +49 89 2399-6056 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/US 03/04944**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*):

Description, Pages

1-18 as originally filed

Claims, Numbers

1-6 received on 22.03.2004 with letter of 22.03.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23:1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☒ the claims, Nos.: 7
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1 - 6
	No: Claims	-
Inventive step (IS)	Yes: Claims	1 - 6
	No: Claims	-
Industrial applicability (IA)	Yes: Claims	1 - 6
	No: Claims	-

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US03/04944

Concerning paragraph I:

The examination is being carried out on the **following application documents:**

Text for the Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LT LU LV MC MK NL PL PT RO SE SI
SK TR

Description, pages:

1-18 as originally filed

Claims, No.:

1-6 as received on 22/03/2004 with letter of 22/03/2004

Concerning paragraph V:

Particularly relevant documents:

D1: US-A-5 486 655 (IWASAKI YORIO ET AL) 23 January 1996

D2: GB-A-1 554 429 (WESTINGHOUSE ELECTRIC CORP) 24 October 1979

The documents D3 - 5 were not cited in the international search report. A copy of the documents is appended hereto:

D3: DATABASE WPI, Week 199348, Derwent Publications Ltd., London, GB, AN 1993-383661 & JP 5287696 A (NIPPON KAYAKU) 2 November 1993

D4: US-A-5362421 (3M) 8 November 1994

D5: DATABASE WPI, Week 200105, Derwent Publications Ltd., London, GB, AN 2001-034285 & JP 2000230038 A (TOSHIBA) 22 August 2000

1. Novelty (Art. 33 (2) PCT)

- 1.1 Document D1 reveals a cationically polymerizable adhesive composition comprising (1) cationically polymerizable polyfunctional epoxy resins having at least 3 epoxy groups in the molecule, which can be regarded as monomers in the sense of the present application (cf. page 4, lines 13 -15 of the application), (2) a catalyst for cationic polymerization, such as UVI-6970, and (3) a solvent for the polymerization catalyst, wherein the solvent is a mixture of a good solvent and a poor solvent for the cationic polymerization catalyst (D1, e.g. example 1). A

mixture of 50 parts of methyl ethyl ketone and 50 parts of xylene is used for dissolving the mentioned components in example 1 of D1.

Furthermore, the epoxy compositions of D1 can comprise liquid epoxy resins which are liquid at room temperature, such as Epikote 828 (D1: column 10, lines 11 - 14) being also a suitable epoxy monomer in the sense of the present application (application, page 4, line 25).

Adhesive sheets are formed by applying the epoxy compositions of examples 1 - 3 of D1 to a polyethylene terephthalate film as release substrate and drying the thus manufactured films (D1, column 11, lines 21 - 27)

D1 discloses several alternatives for UVI-6970, including SP-170 (D1, column 8, line 25), a photocatalyst which can be cured by visible light (see D3, abstract). However, D1 does not teach the use of an iron-arene complex having an absorption peak in a visible light range of from 360 to 830 nm. Furthermore, D1 does not unambiguously disclose *anisotropically electroconductive* adhesive compositions comprising i.a. *electroconductive* particles: the teaching of D1 points per se away from electroconductive adhesives (adhesives comprising an epoxy resin, a curing agent, a reactive diluent and a catalyst for electroless plating as an adhesive sheet having high insulation resistance in place of rubber adhesives having low insulation resistance are disclosed in D1 as progress in the technical field, cf. D1: column 2, lines 16 - 28, see also column 3, lines 11 - 34). Furthermore, it is not clear whether the inorganic particles having adsorbed metallic palladium (column 11, lines 1 - 5) are electrically conductive.

Document D2 also discloses a cationically polymerizable adhesive composition comprising (a) cationically polymerizable epoxy monomers, (b) a catalyst for cationic polymerization, and (c) a solvent for the polymerization catalyst, wherein the solvent is a mixture of a good solvent and a poor solvent for the cationic polymerization catalyst: in example 1 of D2, 50 grams of toluene and 50 grams of methyl ethyl ketone are used. The formulation is used for bonding glass woven fabric to mica paper (see also D2, page 8, lines 44 - 47). However, D2 does neither disclose a cationic polymerization catalyst being an iron-arene complex, nor are anisotropically electroconductive adhesive compositions comprising electroconductive particles revealed in the document.

- 1.2 In the light of documents D1 and D2, the subject-matter of amended claims 1 - 6 of the present application is novel in the sense of Art. 33 (2) PCT.

2. Inventive step (Art. 33 (3) PCT)

- 2.1 Subject-matter of amended claims 1 and 6: The technical problem addressed by the present application is to provide cationically polymerizable adhesive compositions which exhibit high curing rates and improved storage stability over the prior art adhesive compositions. The compositions can be useful for connecting electrodes and flexible integrated circuits of liquid crystal displays by thermocompression bonding (present application, page 1, lines 8 - 15, page 2, lines 16 - 25).
- 2.2 The technical problem is solved by the subject-matter of amended claim 1 of the present application. Iron-arene complexes are preferably utilized as cationic polymerization catalysts due to their thermal stability (cf. page 6, lines 2 - 14 and amended claim 1 of the present application). The optionally desired electrical conductivity of the adhesive compositions is accomplished by the addition of electroconductive particles (page 7, lines 24 - 28 and amended claims 3 and 6 of the present application).
- 2.3 Documents D4 also relates to anisotropically conductive adhesive compositions being useful for connecting flexible printed circuits to flat panel displays (D4, column 1, lines 6 - 9). The compositions of D4 also comprise (1) at least one cationically curable epoxy monomer and (2) a cationic polymerization catalyst, such as bis-([η]⁶- mesitylene)iron(II)hexafluoroantimonate, the latter being a preferred catalyst mentioned in the application. Typically, the adhesive compositions of D4 will also be coated onto release substrates and used as transfer adhesives. The compositions of D4 may also comprise solvent for dissolving the catalysts in the epoxy monomers (D4, column 9, lines 23 - 29 and 57 - 60).
- 2.4 Therefore, document D4 is considered as closest prior art.
- 2.5 Document D4 does not disclose that the crystal size of the catalyst of the dried

adhesive can be adjusted and optimized by the combination of solvents in the adhesive composition. An improved storage stability of the adhesive compositions of the application can be ascribed to this solvent optimization (see examples provided in the present application).

- 2.6 Document D5 (cited by the applicant) also describes cationic polymerization catalysts, such as iron arene compounds (D5, claim 3), which are designed for hardening cationically curable resins, such as epoxy resins (D5, paragraph 0001). The resins of D5 are storage stable (D5, abstract). It is stated in D5 that the catalyst should form a deposit in the epoxy resin, and that the active site of the catalyst is isolated from the epoxy resin by formation of colloids, micels or crystals of the catalyst (physical separation of catalyst and reactive resin). The reactivity of the catalyst is related to its particle diameter, and the latency of the catalyst can be checked by storage stability tests (D5, paragraph 27). However, it is not evident from the combination of the technical teaching of documents D4 and D5 that a combination of a good and a poor solvent for the cationic polymerization catalyst in the adhesive compositions claimed would bring about the desired improvement of storage stability.

- 2.7 Therefore, the subject-matter of amended claims 1 - 6 of the present application meets the requirements of Art 33(3) PCT in view of the cited documents D1 - D5.

3. Industrial applicability

- 3.1 The subject-matter of amended claims 1 - 6 of the present application is industrially applicable.